We claim:

1. An integrated process flow involving a patterned photoresist layer on a substrate in an etching tool that has one or more process chambers, said patterned photoresist layer having an opening with a top and bottom that extends through at least one underlying layer in said substrate, comprising:

(a) performing an oxygen ashing step to remove said patterned photoresist layer;

(b) performing a halogen containing plasma step; and

(c) transferring said opening through an exposed layer at the bottom of said opening in said substrate.

2. The method of claim **1** wherein said etching tool is a split power etcher, a dual power etcher, a single power etch tool, a reactive ion etcher, or a conventional barrel, direct, or downstream type of ashing tool.

3. The method of claim **1** wherein steps (a) and (b) are performed in the same process chamber of said etching tool.

4. The method of claim **1** wherein steps (a), (b), and (c) are performed in the same process chamber of said etching tool.

5. The method of claim **1** wherein said halogen containing plasma step involves a plasma that is formed from one or more of CF_4, CH_2F_2, SF_6, NF_3, Cl_2 and $C_XF_YH_Z$ where x and y are integers and z is an integer or is 0.

6. The method of claim **5** wherein the halogen containing plasma step includes HBr in combination with one or more of CF_4, CH_2F_2, SF_6, NF_3, Cl_2 and $C_XF_YH_Z$ where x and y are integers and z is an integer or is 0.

7. The method of claim **1** wherein the halogen containing plasma step is comprised of a halogen containing gas flow rate of about 3 to 500 standard cubic centimeters per minute (sccm), a chamber pressure between about 1 mTorr and 3 Torr, a chamber temperature of about -15^{o}C to 150^{o}C, a HFRF power or top RF power from about 100 to 3000 Watts, and a LFRF power or bias power of about 10 to 1000 Watts for a period of less than about 60 seconds.

8. The method of claim **1** wherein the etching tool is a single power tool and the halogen containing plasma step is comprised of a halogen containing gas flow rate of about 3 to 500 sccm, a chamber pressure between about 1 mTorr and 3 Torr, a chamber temperature of about -15^{o}C to 150^{o}C, and a RF power from about 50 to 1000 Watts for a period of less than about 60 seconds.

9. The method of claim **1** wherein said opening exposes an underlying silicon layer and step (c) forms a shallow trench in said substrate.

10. The method of claim **1** wherein said opening exposes an underlying gate layer and step (c) forms a gate electrode.

11. An integrated process flow for removing oxide residues, comprising:

(a) providing a substrate upon which a stack comprised of an upper patterned photoresist layer, a middle masking layer, and a lower pad oxide layer is formed and positioning said substrate in a process chamber of an etching tool, said patterned photoresist layer having a trench opening that extends through the masking layer and pad oxide layer;

(b) performing an oxygen ashing step to remove the patterned photoresist layer, said oxygen ashing step generates oxide residues on said substrate; and

(c) performing a halogen containing plasma step to remove said oxide residues.

12. The method of claim **11** further comprised of a plasma etch after the halogen containing plasma step to transfer said trench opening into said substrate.

13. The method of claim **12** wherein said plasma etch step is performed in the same etch tool as the halogen containing plasma step.

14. The method of claim **11** wherein the masking layer is comprised of silicon nitride or polysilicon and the substrate is a silicon substrate.

15. The method of claim **11** wherein said halogen containing plasma step involves a plasma that is formed from one or more of CF_4, CH_2F_2, SF_6, NF_3, Cl_2 and $C_XF_YH_Z$ where x and y are integers and z is an integer or is 0.

16. The method of claim **11** wherein the halogen containing plasma treatment is comprised of a halogen containing gas flow rate of about 3 to 500 sccm, a chamber pressure between about 1 mTorr and 3 Torr, a chamber temperature of about -15°C to 150°C, a HFRF power from about 100 to 3000 Watts, and a LFRF power of about 10 to 1000 Watts for a period of less than about 60 seconds.

17. The method of claim **11** wherein the etching tool is a single power tool and the halogen containing plasma step is comprised of a halogen containing gas flow rate of about 3 to 500 sccm, a chamber pressure between about 1 mTorr and 3 Torr, a chamber temperature of about -15°C to 150°C, and a RF power from about 50 to 1000 Watts for a period of less than about 60 seconds.

18. The method of claim **11** wherein the stack further includes an organic ARC layer between the masking layer and the patterned photoresist layer and wherein the ARC layer is removed during the oxygen ashing step.

19. An integrated process flow for removing oxide residues, comprising:

(a) providing a substrate upon which a stack including a gate dielectric layer, a gate layer, a hard mask layer, and a photoresist layer are sequentially formed and positioning said substrate in a process chamber of an etching tool, said photoresist layer has a pattern comprised of openings that extend through the hard mask layer;

(b) performing an oxygen ashing step to remove the patterned photoresist layer, said oxygen ashing step generates oxide residues on said substrate; and

(c) performing a halogen containing plasma step to remove said oxide residues.

20. The method of claim **19** further comprised of a plasma etch after the halogen containing plasma step to transfer said pattern through the gate layer to form a gate electrode.

21. The method of claim **20** wherein said plasma etch step is performed in the same etch tool as the halogen containing plasma step.

22. The method of claim **19** wherein the gate dielectric layer is comprised of SiO_2 or a high k dielectric material.

23. The method of claim **19** wherein the gate layer is comprised of polysilicon or amorphous silicon.

24. The method of claim **19** wherein the hard mask is silicon nitride, silicon oxynitride, or silicon oxide.

25. The method of claim **19** wherein said halogen containing plasma step involves a plasma that is formed from one or more of CF_4, CH_2F_2, SF_6, NF_3, Cl_2 and $C_XF_YH_Z$ where x and y are integers and z is an integer or is 0.

26. The method of claim **19** wherein the halogen containing plasma step is comprised of a halogen containing gas flow rate of about 3 to 500 sccm, a chamber pressure between about 1 mTorr and 3 Torr, a chamber temperature of about -15^{O}C to 150^{O}C, a HFRF power from about 100 to 3000 Watts, and a LFRF power of about 10 to 1000 Watts for a period of less than about 60 seconds.

27. The method of claim **19** wherein the etching tool is a single power tool and the halogen containing plasma step is comprised of a halogen containing gas flow rate of about 3 to 500 sccm, a chamber pressure between about 1 mTorr and 3 Torr, a chamber temperature of about -15^{O}C to 150^{O}C, and a RF power from about 50 to 1000 Watts for a period of less than about 60 seconds.

28. The method of claim **19** wherein the stack further includes an organic ARC layer between the hard mask and the patterned photoresist layer and wherein the ARC layer is removed during the oxygen ashing step.

29. An integrated process flow for removing oxide residues, comprising:

(a) providing a substrate having a stack comprised of an upper patterned photoresist layer, a middle dielectric layer, and a lower etch stop layer formed thereon and positioning said substrate in a process chamber of an etching tool, said patterned photoresist layer having an opening formed therein which extends through said dielectric layer and exposes a portion of said etch stop layer;

(b) performing an oxygen ashing step to remove the patterned photoresist layer, said oxygen ashing step generates oxide residues on said substrate; and

(c) performing a halogen containing plasma step to remove said oxide residues and the exposed portion of said etch stop layer.

30. The method of claim **29** further comprised of a plasma process after the halogen containing plasma step to remove polymer residues formed during removal of the exposed etch stop layer.

31. The method of claim **30** wherein said plasma process is performed in the same etch tool as the halogen containing plasma step.

32. The method of claim **29** wherein the opening in the dielectric layer is a via, a contact hole, a trench, or a trench formed above a via.

33. The method of claim **29** wherein the stack is further comprised of a cap layer between the dielectric layer and the patterned photoresist layer.

34. The method of claim **29** wherein the stack is further comprised of an organic ARC layer between the dielectric layer and the patterned photoresist layer, said organic ARC is removed with the patterned photoresist during the oxygen ashing step.

35. The method of claim **29** wherein the etch stop layer is silicon nitride, silicon carbide, or silicon oxynitride.

36. The method of claim **29** wherein the dielectric layer is comprised of SiO_2, PSG, BPSG, or a low k dielectric material which is fluorine doped SiO_2, carbon doped SiO_2, a silsesquioxane polymer, a poly(arylether), or benzocyclobutene.

37. The method of claim **29** wherein said halogen containing plasma step involves a plasma that is formed from one or more of CF_4, CH_2F_2, SF_6, NF_3, Cl_2 and $C_XF_YH_Z$ where x and y are integers and z is an integer or is 0.

38. The method of claim **29** wherein the halogen containing plasma step is comprised of a halogen containing gas flow rate of about 3 to 500 sccm, a chamber pressure between about 1 mTorr and 3 Torr, a chamber temperature of about -15^{O}C to

150^{o}C, a HFRF power from about 100 to 3000 Watts, and a LFRF power of about 10 to 1000 Watts for a period of less than about 60 seconds.

39. The method of claim **29** wherein the etching tool is a single power tool and the halogen containing plasma step is comprised of a halogen containing gas flow rate of about 3 to 500 sccm, a chamber pressure between about 1 mTorr and 3 Torr, a chamber temperature of about -15^{o}C to 150^{o}C, and a RF power from about 50 to 1000 Watts for a period of less than about 60 seconds.